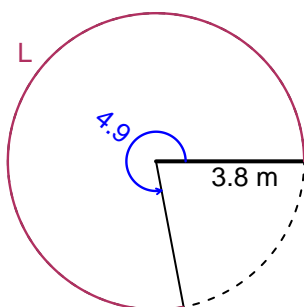# Trig Final (Solution v4)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 3.8 meters. The angle measure is 4.9 radians. How long is the arc in meters?
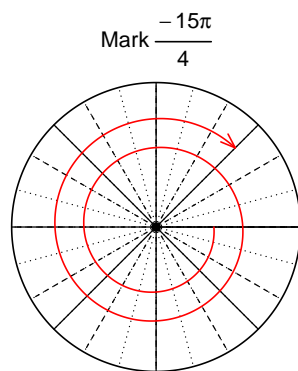

$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$
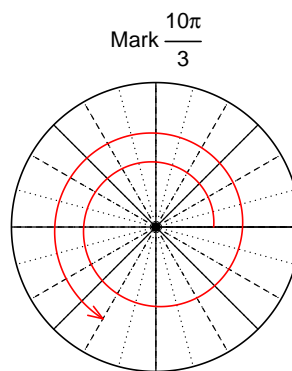
$L = 18.62$ meters.

Question 2

Consider angles $\frac{-15\pi}{4}$ and $\frac{10\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-15\pi}{4}\right)$ and $\cos\left(\frac{10\pi}{3}\right)$ by using a unit circle (provided separately).

Mark $\dfrac{-15\pi}{4}$ Mark $\dfrac{10\pi}{3}$

Find $\sin(-15\pi/4)$ Find $\cos(10\pi/3)$

$\sin(-15\pi/4) = \frac{\sqrt{2}}{2}$ $\cos(10\pi/3) = \frac{-1}{2}$

Question 3

If $\cos(\theta) = \frac{-11}{61}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.
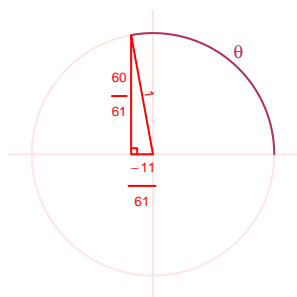
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.

Solve the Pythagorean Equation

$$11^2 + B^2 = 61^2$$
$$B = \sqrt{61^2 - 11^2}$$
$$B = 60$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.

$$\tan(\theta) = \frac{\frac{60}{61}}{\frac{-11}{61}} = \frac{-60}{11}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 6.41 meters, a frequency of 2.51 Hz, and a midline at $y = -8.57$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.41\sin(2\pi 2.51t) - 8.57$$

or

$$y = -6.41\sin(5.02\pi t) - 8.57$$

or

$$y = -6.41\sin(15.77t) - 8.57$$